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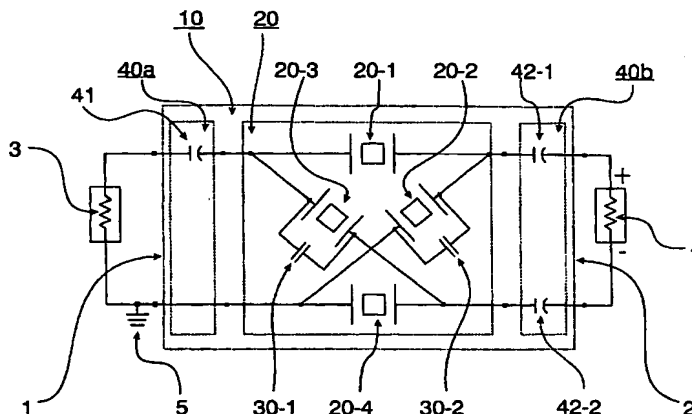
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(54) Title: **RESONATOR FILTER STRUCTURE HAVING EQUAL RESONANCE FREQUENCIES**



(57) Abstract: The invention relates to a resonator filter structure (10) for radio frequency (RF) filters, especially a bulk acoustic wave (BAW) filter structure. According to the invention, a resonator filter structure (10) is constructed with a BAW lattice filter section (20), in which all of the BAW resonator elements (20-1, 20-2, 20-3, 20-4) within the BAW lattice filter section (20) have substantially equal resonance frequencies. According to the invention, there are parallel capacitances (30-1, 30-2) connected in parallel to the BAW resonators (20-2, 20-3) of one branch type of the BAW lattice filter section (20). Thus, anti-resonance frequency of the respective BAW resonator (20-2, 20-3) is tuned. That results in a very narrow passband which corresponds approximately to the difference in anti-resonance frequencies between diagonal and horizontal branches of the lattice filter section (20). The parallel capacitances (30-1, 30-2) are used to tune the bandwidth: the smaller the capacitance, the smaller the bandwidth. Moreover, due to the lattice structure at one port of the resonator filter signal guidance will be balanced while at the other port signal guidance can be unbalanced or balanced according to the application needs.

10/54282

WO 2004/066490 A3



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## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H03H9/64 H03H9/58 H03H9/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H03H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, INSPEC, COMPENDEX, IBM-TDB

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2001/012237 A1 (TANIGUCHI NORIO) 9 August 2001 (2001-08-09) cited in the application paragraph '0050! - paragraph '0053!; figure 1	1-12
A	WO 02/082647 A (AIGNER ROBERT ; INFINEON TECHNOLOGIES AG (DE); NOKIA MOBILE PHONES LTD) 17 October 2002 (2002-10-17) page 6, line 15 - page 8, line 18; figures 3,4	1-12
A	EP 1 104 097 A (NOKIA MOBILE PHONES LTD) 30 May 2001 (2001-05-30) paragraph '0017! - paragraph '0018!; figure 5 paragraph '0020! - paragraph '0021!; figure 7a	1-12



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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# INTERNATIONAL SEARCH REPORT

for information on patent family members

International Application No

/ 3/06368

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
US 2001012237	A1	09-08-2001	JP	3389911 B2		24-03-2003
			JP	2001223559 A		17-08-2001
			GB	2365639 A ,B		20-02-2002
WO 02082647	A	17-10-2002	WO	02082647 A1		17-10-2002
			EP	1371135 A1		17-12-2003
			JP	2004519180 T		24-06-2004
			US	2003179053 A1		25-09-2003
EP 1104097	A	30-05-2001	FI	992547 A		30-05-2001
			CN	1298271 A		06-06-2001
			EP	1104097 A2		30-05-2001
			JP	2001177365 A		29-06-2001
			US	6388544 B1		14-05-2002